City of Alexandria, VA
Final Report

Project Name: New Public Interactive Maps - Community Participation

Department: Information Technology Services, Applications Division

Focus Area: GIS Applications

Product/Process: Usability Testing, Public Interactive Maps

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3.0	9/15/2014	J. Kanzler	Final document for publication

TABLE OF CONTENTS

1 Project Background

1.1 Project Background Overview

Project Goal

Update the City's online system of interactive maps to be more meaningful, usable, interactive, and better integrated in the City's web site

Project Approach

Instead of programming an interactive mapping application from scratch, the City of Alexandria purchased Geocortex – a development framework with out-of-the-box interactive map design support for desktop as well as mobile devices. Geocortex enables us to quickly build mapping sites for testing by users, and focus our energies on capabilities and design. It is flexible and extensible, enabling us to program and configure alternative options for desktop and mobile devices. Where most impactful and feasible, the City of Alexandria ITS Applications staff has modified and enhanced the design to resolve usability issues encountered during testing. Since the core interface and tool set are designed, many more maps can be built upon it. This level of civic engagement early on can greatly improve the utility and longevity of a resource such as these interactive maps. In addition, the "map feedback" tool embedded in each application remains an integrated part of the design, and the maps will be continuously improved.

1.2 Usability Testing Methods

(1) The public is notified of testing times by the City web site (City Calendar and GIS page), and via eNews and paper flyers.
(2) A Usability Testing Coordinator (a City staff member) visits public locations throughout the City, such as libraries, farmer's markets and recreation centers, setting up a table with a laptop, iPad, and iPhone.
(3) When a volunteer approaches the table, the Testing Coordinator explains the Interactive Maps usability testing project, emphasizing that:
    - the maps are in the early phase of development,
    - the applications are being tested and *not the volunteer*, and
    - all information is anonymous (all names and email addresses left are purely voluntary).
(4) If the tester decides to volunteer as a tester, he/she then selects a device and map to test.
    - Volunteers may test on their own device or a City supplied device.
(5) The Testing Coordinator guides the user through the interface, being directed to think aloud and answering questions about the interface as they proceed through it.
(6) The Testing Coordinator takes notes on all of the questions, processes, steps taken, search terms, methods, devices, and order of control exploration.
(7) The tester is then referred to a survey to complete, which allows her/him to anonymously offer feedback on the map, application, and experience.
(8) Points of confusion, suggested enhancements, and preferences that are observed in multiple testers become opportunities for redesign.

Frequently Asked Questions (FAQ)

What is usability testing?
Usability testing is a technique used to evaluate a product by testing it on people representative of those who are going to use it – we call these people "users." This is a valuable practice for developers like us because we get direct input on how real users will use what we've designed.

Why are we conducting usability testing?
By asking a range of users to test our new Interactive Mapping Tools, we will be able to identify and address sources of confusion and errors in its design that we might otherwise miss. By avoiding costly fixes, usability testing reduces the overall cost of a custom application like this, especially when performed early in the development process (as is the case here). In addition, by increasing user satisfaction, we hope to extend the life of the Interactive Mapping Tools, and thereby lower the replacements costs.

What does the process entail and how much time will it take?
The process consists of a short usability test on the computer (approximately 20 minutes per user). While the user is navigating through the prototype of our Interactive Mapping Tool, the person conducting the testing will take notes on all of the questions, processes, steps taken, search terms, methods, devices, and order of control exploration. The goal is to understand how the design of these interactive maps can best serve the needs of those who will use it. The experience is very relaxed because usability testing is focused on testing the application, and not the user.

What is a Prototype?
For these purposes, a prototype is an early model of a website, built in hours using rapid application development tools (in this case, Latitude Geographics' Geocortex framework) instead of months of expensive programming tools and techniques. Geocortex is flexible and extensible and the City of Alexandria ITS Applications staff will modify and add tools and modules to resolve usability issues encountered during testing, where most impactful and feasible.

When and where was testing held?
Opportunities for community participation were available at various times and locations throughout the city (e.g., libraries, rec/community centers). The City's Geographic Information Systems web site provided the details (www.alexandriava.gov/gis).

What kind of testers did we look for?
To ensure that we address all possible issues that may come up with the design and content, we hoped to get participation from a wide spectrum of testers. Some key characteristics of users we wanted to test include people who are non-technical, technical, curious, creative, map lovers, those with a GIS background, and those who might not find maps particularly useful. We also wanted to ensure that the usability testers are people of various genders, ages, education levels, and skill sets.

Was the testing anonymous and how will the results be calculated?
The testing was anonymous. The detailed data we collected was stored and anonymized in an internal data file. We collected qualitative and quantitative data derived from our observations at a summary level that doesn't reflect individual tests or users.

1.3 Project Schedule

In-person usability testing	April 19th – August 1st, 2014
Online usability testing	April 18th – August 1st, 2014
Ongoing design revisions	April 28th – May 27th, 2014
Draft Usability testing results summary and City Actions	June 16th, 2014
Evaluate costs and apply recommendations	July 1st – August 8th
Publish the list of recommendations and a response for each explaining why/how it was, will be, or was not incorporated. Publish *Map-Based Search Tool* with three maps for online testing and public feedback.	August 8th
Incorporate testing results and feedback to revise the *Map-Based Search Tool*.	August 15th – 29th
Publication of the *Map-Based Search Tool.* Ongoing feedback welcome, and will be addressed through future development cycles.	~~September 1.~~ *Delayed until September 30th, due to staff changes*

1.4 Testing Schedule

James M. Duncan Library	April 19th - 24th, July 9th
Charles E. Beatley Library	April 28th - May 4th, July 19th
Kate Waller Barrett Library	May 5th - May 9th, July 15th
Ellen Coolidge Burke Library	May 13th - May 16th, July 24th
First Baptist Church - community event	June 4th
Charles Barrett Rec Center	June 9th
Charles Houston Rec Center	June 10th
Chinquapin Rec	June 14th
YMCA, Monroe Avenue*	June 28th
Mt. Vernon Rec Center	July 7th
Northern Virginia Community College (NVCC)	July 10th, July 16th*
Del Ray Farmers Market	July 12th
Four Mile Run Farmers Market	July 27th

** There were no participants at these dates and times*

2 Usability Testing Results - Summary

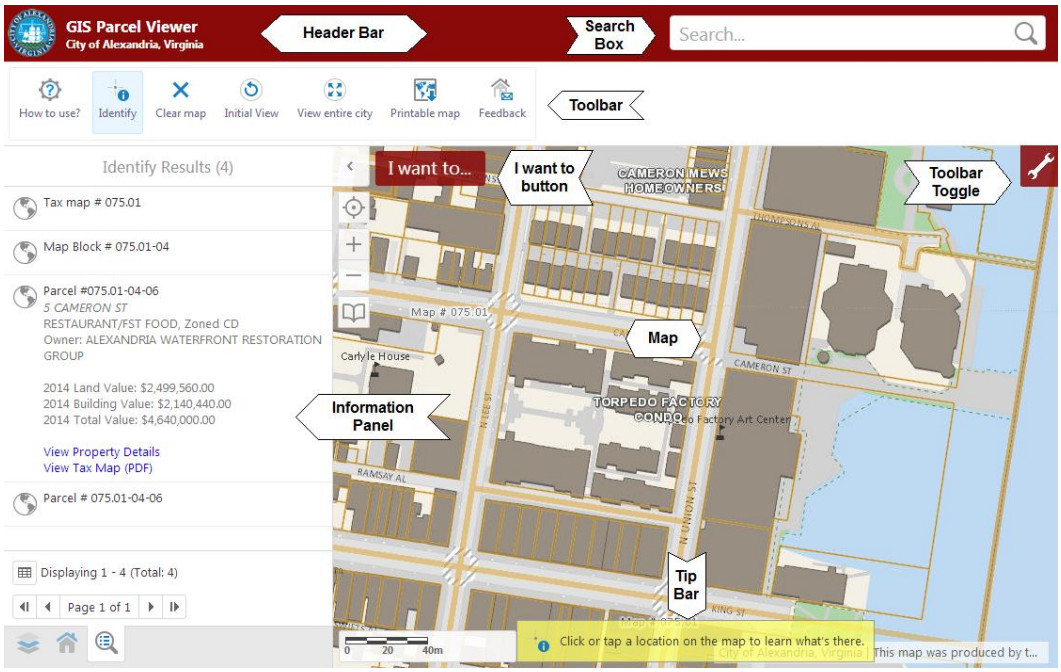
2.1 Overview

General Summary

A total of 32 individuals volunteered at the various community sites to test the Interactive Mapping tools. An additional 18 individuals have tested the application online on their own and offered feedback. We would like to thank these individuals for taking the time to participate in our testing, and performing this critical role in our design process.

The overall response was positive, and feedback has been constructive. About 38% of the testers weren't aware that the City had interactive maps on its site, but most considered the viewers an asset to the site after working with them, and appreciated the opportunity to participate in the testing. The testers were, on average, very familiar with maps. All were comfortable using maps for directions, perhaps due to the ubiquity of Google Maps and GPS. 90% were comfortable using them for general reference, viewing statistical information, and getting weather forecasts. Only 60% were comfortable using them for terrain information.

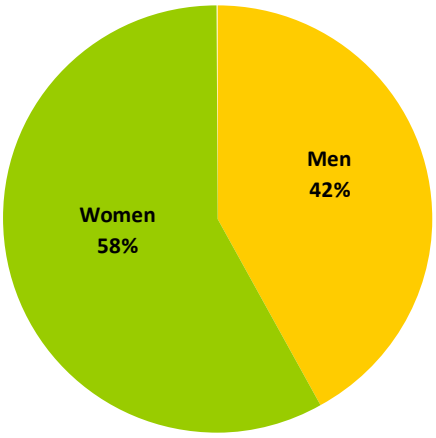
Many users felt that the maps were of greatest use to individuals looking to move to Alexandria. The volunteer testers understood that the maps are in the early stages of development, but asked for more focus on providing detailed information and useful tools for residents. A number of users wanted a more wizard-like interaction to guide them step-by-step through the process of accessing the information they were after. A few users even verbalized this preference.
Below is an annotated screenshot of an early iteration of one of the test maps, displaying the key components of the user interface.

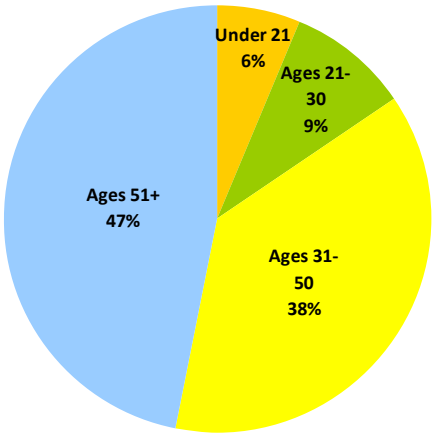


The results of the usability testing to date is summarized below in these key areas: (1) Google Expectations, (2) Richness of Detail, (3) Wizards, (4) Legends and Layers, and (5) Comprehensive Map "Portal".

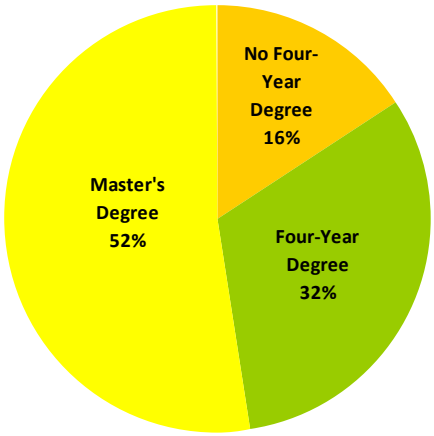
Tester Demographics

The tester demographics have improved considerably since the Interim report. We haven't been able to get a truly representative sample, because we rely on volunteerism rather than a robust, randomized tester selection process. This Usability Testing initiative is in the tradition of open community engagement, more so than it is a strictly scientific operation. As the City improves its ability to reach different segments of the population through better civic engagement, initiatives like these will generate more representative feedback.





Since the interim report, the Male/Female ratio improved from 1:2 to ~2:3. In addition, the percentage of testers 50 and under improved from 40% to 53%. According to Census 2010, this age group only makes up approximately 27% of City population, so they are overrepresented in the test group. Those with advanced degrees decreased from 64% to 52% of the test group since the interim report. It's especially important that the application design not be biased towards high educational attainment, and for the City to continue creating applications that are usable by as many populations as possible.



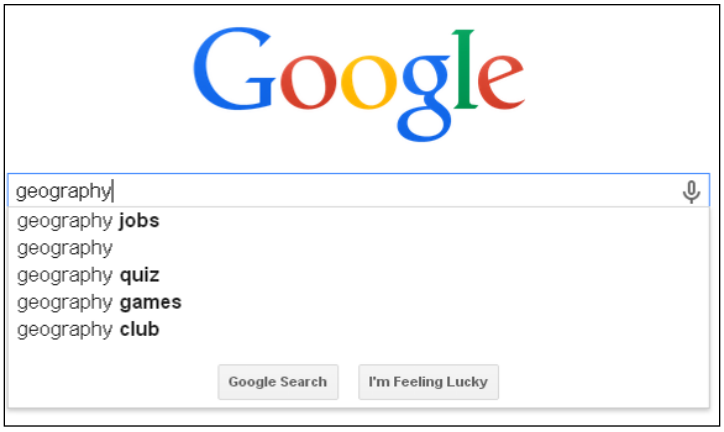
** Education data collected from survey responses - only 19 out of the 32 total participants completed it and answered this question*

2.2 Usability Fixes and Enhancements

Google Expectations

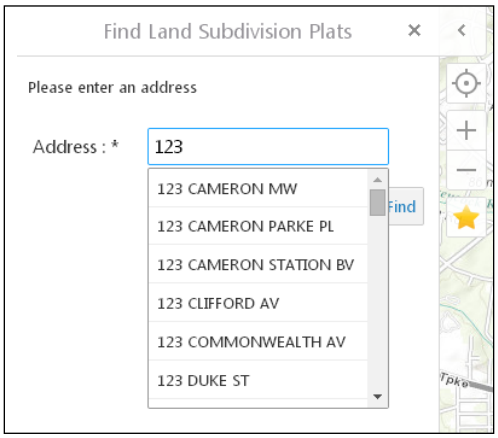
The majority of the users preferred to dive right into navigating the map, rather than using the search tools around the map. As expected, testers were able to quickly and easily pick up the map and interact with it using common Google and mobile navigation techniques. Nowadays, users generally know how to pan a map by swiping with a finger or dragging with a mouse, and they know how to zoom with the scroll bar or by using a pinching gesture. The spread of this knowledge follows the explosion of Google Maps, GPS, and similar navigation aids.

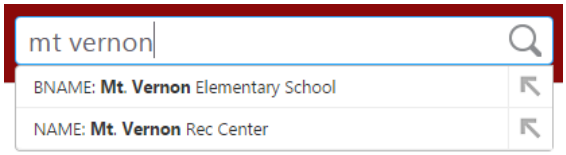
Testers consistently demonstrated a desire for additional Google-like behavior. For example, testers entered natural English searches into the Global Search Box like “Sewers near W. Mt. Ida,” “SUPs on Mt. Vernon” and “Fairfax and King.” The search tool currently operates more like a keyword database search, and doesn’t have as much semantic handling as Google. In addition, 63% of users requested that all searches generate a list of hints as the user types ("autocomplete") like Google.



There were also repeated concerns over the differences between the behavior of the Global Search Box and the searches available from the ‘I want to’ menu. Each search seems to return different results and certain things are findable through one search and not another.

We have enabled an autocomplete feature in the Global Search Box and are continuing the process of adding autocompletes to all search boxes. (Note: The presence of the database field "FULL_ADDS" is a built in limitation of our Geocortex software - we have identified it as an issue and will resolve it as soon as we can). We will continue to make sure that all searches return results in the same way, so that users aren’t confused into thinking that the arbitrary differences are meaningful. By adding an autocomplete capability, we are bringing the behaviors of the search boxes in line with one another, and keeping to user expectations to emulate Google behavior.

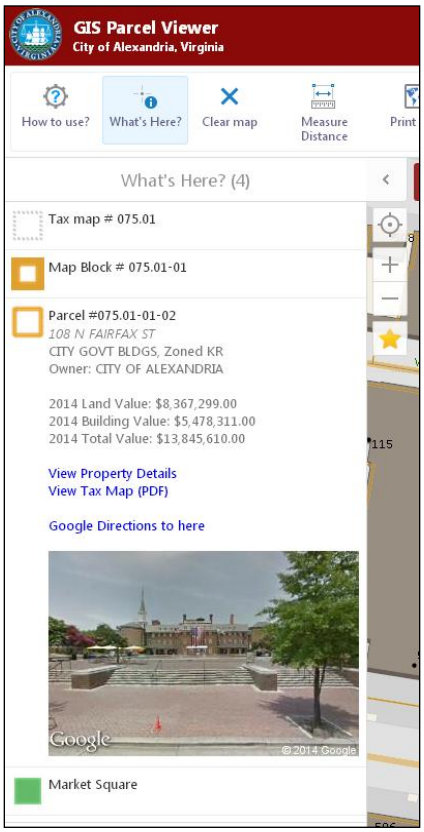




In addition, search results, while numerous like Google, do not appear to rank as well. For example, certain projects in the Planning & Development viewer will be of greater interest - i.e., those that are the subject of active debate or are going before council. Adding such intelligence will most likely be a part of a larger effort to rethink how the City engages the public via the web.

One potential tester even remarked that (s)he wouldn't test or use the Alexandria's interactive maps because (s)he just uses Google. That, coupled with the fact that almost 40% of the testers weren't aware that the City publishes interactive maps, makes it **important for the City to clarify roles for City GIS and Google**. Each has their own strengths. Google is a free resource that has street-level imagery, a robust and up-to-date business database, and directions capabilities beyond most transportation databases. However, Google Maps do not display information relevant to City operations and policies. You can't use them to determine when your garbage will be collected, where you're allowed to park, or what the tax assessments are on properties in your neighborhood. They also don't contain maps, aerial photos, and information as detailed and up-to-date as can be found in the City's databases.

The key is to make the best use of both worlds, and to determine where the best places are to hand off to Google. We will consistently be evaluating opportunities to make the most of Google's capabilities, but we have started by integrating *Google Street View* images and *Google Directions to Here* into the Information Panel for properties on our Parcel Viewer map.

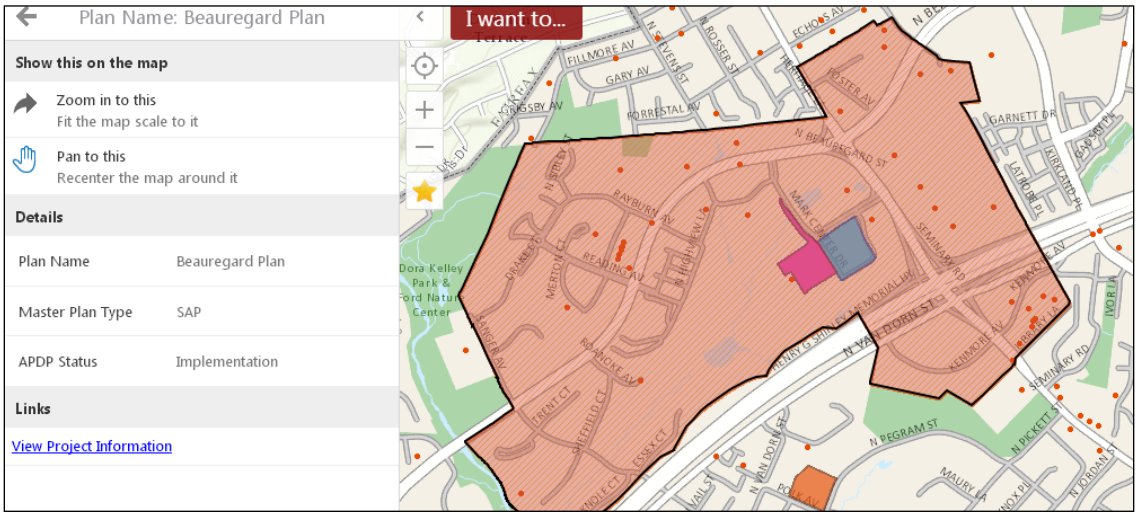


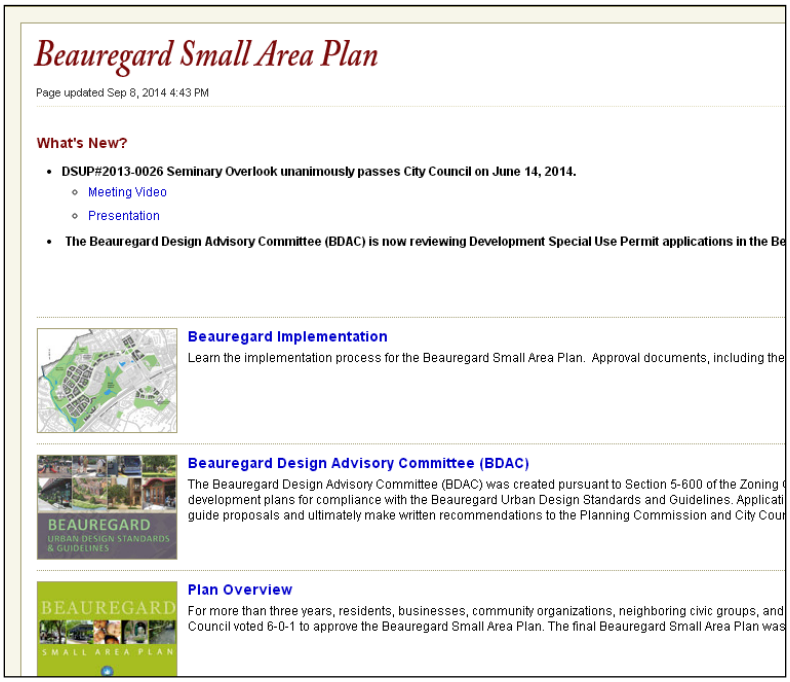
Desire for Detail

The City of Alexandria maintains detailed information, and has a variety of databases that are used to run City operations and create and implement City policy. Testers were able to quickly navigate to a site of interest, e.g., a contentious large-scale development in the Planning & Development Viewer map. Once they were able to pull up the information, they consistently wanted more information about it. In short, **they wanted the benefit of everything they suspected was somewhere in a City file system or database about that site.**

While it's not feasible (or even desirable from a usability perspective) to connect every piece of electronic information maintained by the City with each item on a map, it would be very **helpful for the map to link with existing web pages on the City's web site that provide overviews and documents relating to initiatives and projects**. This process has been underway, and will be considered as the City envisions how it will use its web site for meaningful Civic engagement.

For now, the large-scale planning projects will link to a City web page with details. We will continue working to get more detail and create pages for individual development projects.





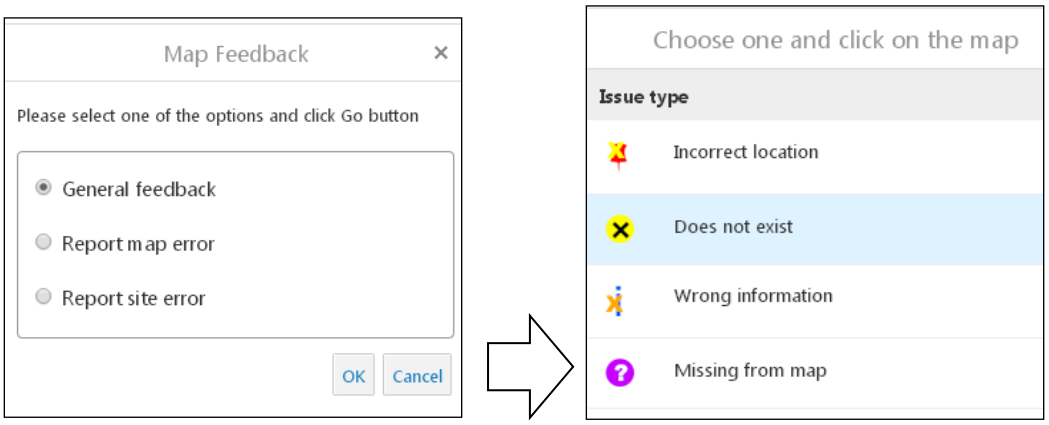
The Usability Testing of our designs revealed considerable **problems with how our Viewers were linking to documents, such as subdivision plans and special use permits**. Concerns related to the slow performance of the system and some search problems. We have resolved a few of the issues identified, and the remainder will likely be addressed when the City's document imaging system gets an upgrade later this year.

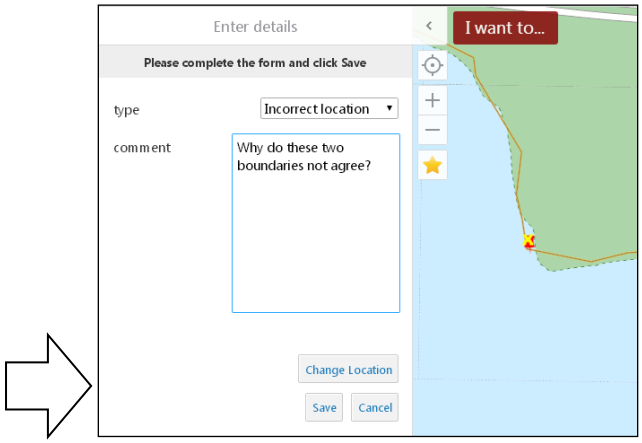
As we move the interactive map design forward, we consider tester feedback that expresses a desire for more than just a visual map and very high level summary.

Wizards and Help

41% of testers asked for a more wizard-like set of questions that would walk the user through common operations, such as retrieving a tax map. A number of these individuals said that they were unsure where and how to start using the map.

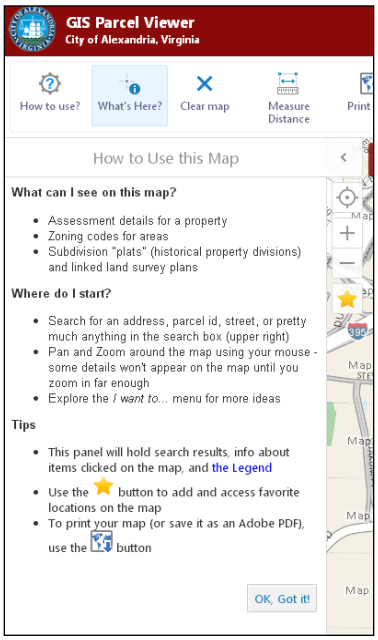
For these reasons, **we are currently in the process of creating more wizard-like operations that guide the user through steps**. Using the Geocortex built-in "workflows" capability, we can readily create a variety of wizards that step the user through dialogs that appear in the left-hand side of the application when on a desktop or tablet device and page the screen on handheld devices. The wizard-like operations that we tested over the summer were effective, but need to be broken down even further into smaller steps with more user feedback. It's also important to balance the need to provide small steps with minimizing user clicks and minimalist design. **One example is the Map Feedback wizard**:





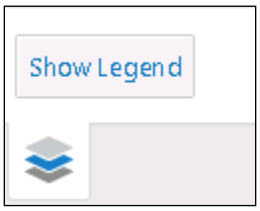
We will continue adding and refining wizards as we identify operations that user desires and add data and viewers throughout the application life.

To help users with a starting point, **we created a smarter start panel that provides a few tips to cover common areas of confusion and answers two questions**, *What can I see on this map*? and *Where do I start?,* which were asked repeatedly by users during testing.

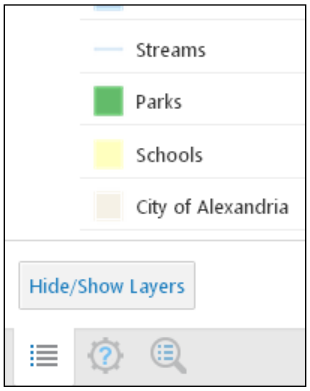


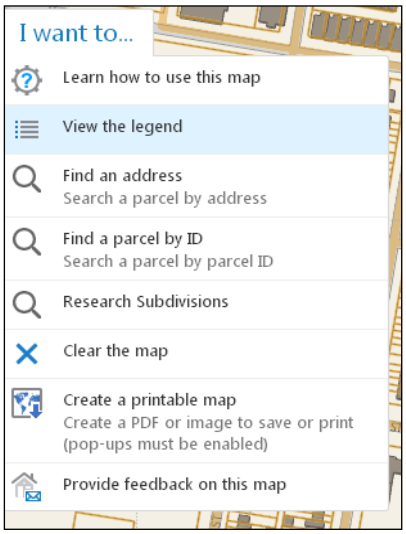
Legends and Layers

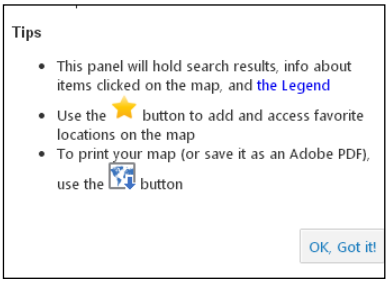
Reflecting the default configuration, our map legends were somewhat buried and **many users commented that they wanted to see the legend either initially upon opening the map, or continuously while using the map**. There was a "layers" icon at the bottom of the Information Panel that the user must click to show the layers. To get the legend, the user must then click the "Show Legend" button. Because "layers" are a technical Geographical Information Systems concept, it doesn't speak the user's language and therefore has low usability.



To resolve this issue, **we made the legend accessible from multiple places.** First, users can access it from the Information Panel tab with an improved legend icon. The legend displays by default, giving the more curious and/or technical users the options of seeing the "layers" (so they can turn them on/off). It is also linked from the second item in the "I want to" menu and from the tips panel. The user can display the legend as long as (s)he wants to, and can easily get back to it, if it is replaced by another dialog.







One surprising result we encountered: users expected the legend to be interactive. This is not a common treatment for legends in mapping applications. Even Google doesn't do this. They didn't agree on what should happen when the user clicks on the symbol swatch, but they just felt like something should happen. Some users said that they wanted to see all of the items of the type they clicked to be highlighted in the map. For example, if the user clicked the parks swatch , all of the parks would get a red or yellow outline and the map might zoom to show them all. This is a very interesting idea, and is something that we've added to our long-term enhancements list.

We did address this somewhat by adding the legend swatch to the search results and to "What's here?" (previously known as "Identify") results.

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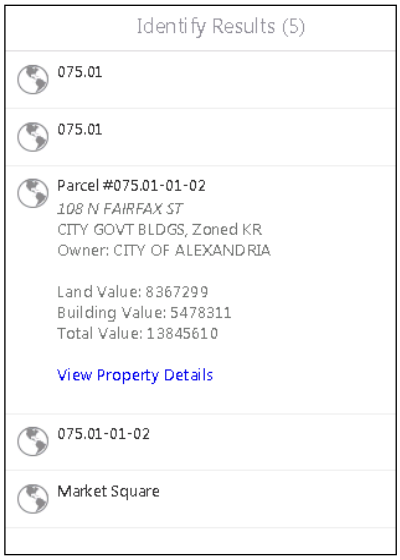
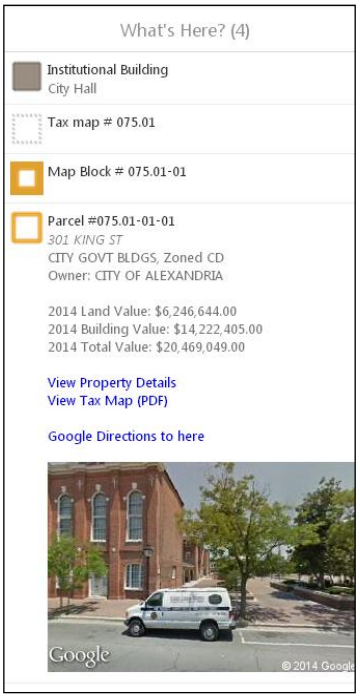


IS NOW:

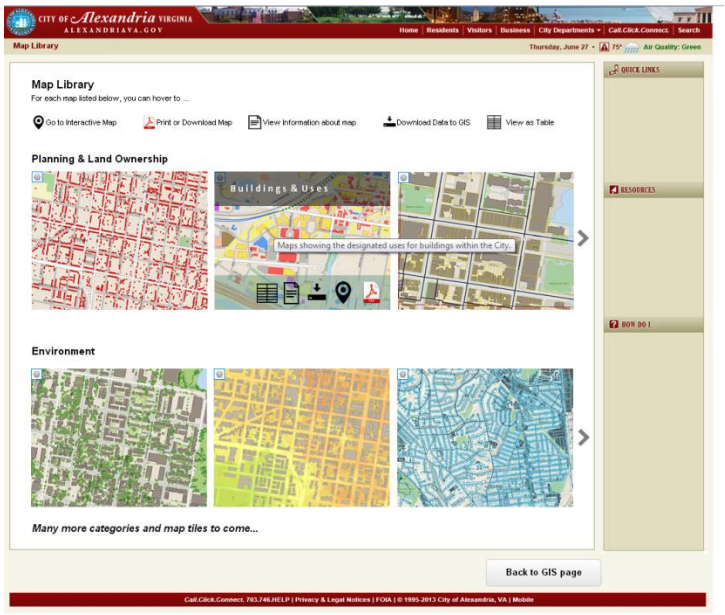


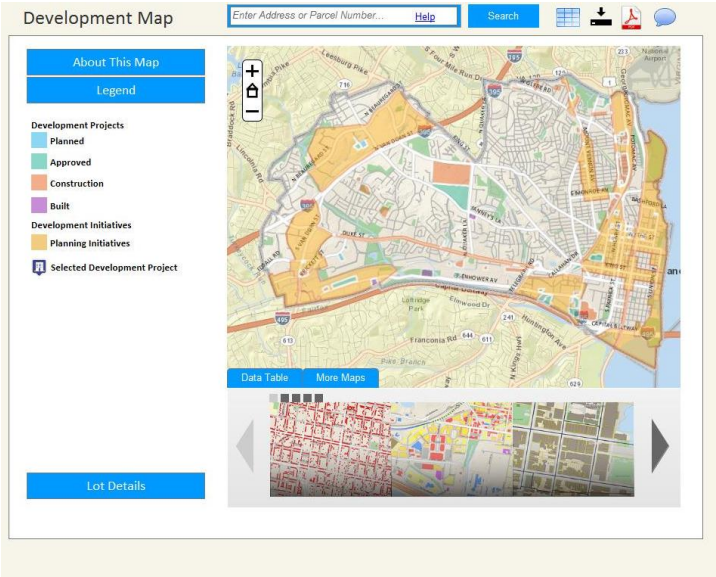
When the user clicks on a result in the Information Panel, the map zooms and highlights that result.

Comprehensive Map "Portal"

Approximately 19% of testers requested that we combine all of the Viewers into a single viewer to create a comprehensive mapping portal. There is evidence from other local governments and other organizations that shows that the small single-use maps get more use than big complex mapping portals that often require reading the help or perhaps some training to use. Our initial designs focus on ways that we can embed maps throughout the City web site where they are needed (e.g., Would that list of Day Care providers work better as map?).

The full vision for the interactive maps is to provide a means to view multiple maps at once in a simple UI (user interface). Similar to a video viewer that a user can click to "pop out" into a more robust viewer, the full viewer would be accessible by clicking on a simple embedded map somewhere on the City's web site, and also from a library similar to the prototype below. The user would add maps together using the carousel at the bottom. This prototype has been usability tested and refined with proxy users - non technical and technical City staff with little or no background in mapping - to help design a portal that won't require training or reading help documents.





The Geocortex framework is well suited to this design - although each viewer may appear to be a separate viewer, it draws on a core set of behaviors and a common look and feel. As a code framework, it ensures that everything is centrally maintained and is therefore easier and less costly to maintain.

2.3 Conclusion

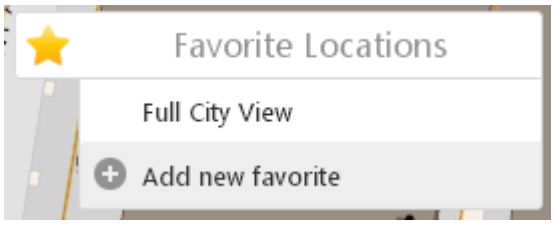
The above sections address the key concerns with the greatest impacts on the Interactive Map design. However, over 100 fixes and enhancements were made through this process. A variety of icons were changed to improve their legibility, and where possible tool descriptions are provided when the user hovers in a desktop environment (this feature doesn't work in a mobile environment because there is no hover capability on a touchscreen). For example, none of the testers understood that the icon shown below opened/closed the toolbar, so we replaced it with a simple up/down arrow that uses a more standard icon to signify to the user that the panel can be opened or closed:

WAS:  IS: 

In addition, language was changed throughout the maps to replace technical terms like "layers," "features, " and "Identify" with clearer terms that "speak the user's language". We also learned about data a variety of problems that are now being resolved, e.g., that roughly 30% of our subdivision boundaries are missing dates.

There were certain features that we removed or completely rethought because they caused confusion or were ignored. For example, the "bookmarks" were a set of pre-defined areas of the City, e.g., "Arlandria", "North Old Town" and "Cameron Station." Users were confused by the icon, but were also frustrated by the lack of boundaries or were concerned that the implied boundaries were incorrect. There is certainly a need to map City associations and neighborhoods, but this is clearly not the way. We replaced it with a "favorite areas" function that enables the user to define their own neighborhoods or

other areas of special interest. The map saves the favorite like a browser bookmarks a web page, so that when the user returns (s)he can use the favorite to zoom to their area of interest.

WAS:  IS: 

In addition, a series of issues relating map navigation in the handheld design are being resolved in response to issues identified by users during testing with their phones, both during usability testing and via on-line map feedback.

Although the formal usability testing period is closed for this Interactive Map design, user feedback will continue via the Map Feedback button and menu item. We will continue to improve and enhance these living applications, especially as the City continues to find new and better ways to use the web to engage its public.